

COMPILATION OF A GLOSSARY OF INTERNATIONAL TERMS RELATED TO PLANETARY CARTOGRAPHY

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Abstract: Maps of planetary objects has become an important new product derived from the space investigations of several nations. These planetary maps are used for both research activities and for dissemination of planetary science results to the general populace of nations throughout the world. The terms used to describe physical and geographical objects on these planetary objects sometimes do not translate to the same meaning in different languages. In an attempt to aid international users of planetary maps in obtaining a correct interpretation of the terrains portrayed on these maps, the ICA Commission on Planetary Cartography has initiated a project to collect terms relevant to planetary maps along with their interpretations in various languages. We are dependent upon obtaining the terms and their definitions from users of planetary maps throughout the international community, and we encourage anyone to submit mapping terms with inconsistent interpretations to either of the authors listed above. A glossary of planetary mapping terms and their interpretations in several languages will be posted on the Commission web site (<http://www.nasm.edu/ceps/ica>). As an example of the potential problem resulting from a misinterpretation of terms, we note that the numerical term “billion” has two distinct meanings in wide usage: one billion means a thousand million (one times ten to the 9th power) in the United States and France, but it means a million million (one times ten to the 12th power) in Great Britain and Germany (Webster’s Dictionary). This difference could cause a significant error in map scale interpretation. Map descriptions can have similar discrepancies in their usage. The glossary should aid in clarifying cases of potential confusion among mapping terms, as well as provide multiple language expressions for common mapping features (“mountain” in English is “berg” in Dutch and German, “montana” in Spanish, and “montagne” in French).

This paper provides an introduction to an on-going project by the ICA Commission on Planetary Cartography. The Commission on Planetary Cartography has committed to compile a glossary of terms frequently used on planetary maps, as well as a list of terms from various countries that can be used to identify features on planetary maps, sometimes with very different meanings.

Glossary of Terms Relevant to Planetary Maps

Users of diverse map products often are challenged to understand the intent of the mapmakers regarding the way certain map items were chosen to be displayed or named. As an aid to the use of such maps, it is common to find a glossary published with the map, to assist map users in understanding what the map represents. This use is merely an application to maps of the broad definition of "glossary" - an explanatory list of the difficult, technical, or foreign words used in a particular work or area of knowledge (Doubleday Dictionary, 1975). It should be noted that as such, a glossary is distinct from the more specific "gazetteer" - a dictionary or alphabetical list of geographical names (Doubleday Dictionary, 1975). The Commission on Planetary Cartography recognized a need for a glossary that provides, in one location, a quick reference to the terms used in a variety of mapping products in planetary science. This glossary is under development and will be available (in its first version) at the 2001 ICC meeting in Beijing. To aid in the wide dissemination of this information, the glossary also will be available at the Commission web site (<http://www.nasm.edu/ceps/ica>), where updates and revisions will be periodically posted.

We next present examples of the kinds of entries contained within the glossary of planetary mapping terms. The first section consists of general terms that have wide applicability to a variety of planetary mapping products. Following are two examples of the kinds of entries found in this generalized section of the glossary:

Planetary body - an object described by the approximately spherical form (shape) that it assumes under the hydrostatic force produced by gravity associated with its mass. The planets, large satellites of planets and the largest asteroids all can fall within a class of planetary bodies prescribed by a mostly spherical shape.

Solar system - all material substance and deep space included within the sphere of the gravitational attraction of the Sun. This includes the Sun, the planetary system, asteroids, comets, and all gas and dust that is gravitationally bound to the Sun. The effective edge of the solar system corresponds to distances from the Sun where the gravitational perturbations of passing stars are of comparable magnitude to the gravitational pull of the Sun itself.

Both of the above examples are descriptions of features that some map users may not appreciate, if they are not already familiar with maps of objects throughout the solar system. The first example gives a working definition for a term that has undergone considerable debate recently, particularly with regard to the status of Pluto. The glossary uses a general description that will allow a map user to understand what is intended by the term without getting into the complexities of the debate over what constitutes a planet.

The second section of the glossary deals with terms that are used specifically in various forms of cartography of objects in the solar system. Following are examples of the kinds of entries found in this section of the glossary:

Planetary cartography includes all cartographic materials produced for objects with solid surfaces external to the Earth. This can include any spatially mapped characteristic (e.g., topography, geology, and geophysical properties) for extraterrestrial surfaces. Also can be referred to as the **Cartography of Extraterrestrial Territories (CET)**.

This example provides a working definition for how broad is the scope of cartographic products of planetary objects, along with an alternate expression for such a description.

The third section of the glossary describes terms that are applied to cartographic products in general, and not restricted solely to maps of planetary objects. There are many resources on cartography that could be used here, but our intent is to provide descriptions for a minimum number of cartographic terms within the glossary to keep the user from having to look up additional references. An example of a general cartographic term is:

Thematic maps include the spatial representation of physical properties for a planetary surface (e.g., hypsometric, geophysical, geologic-morphologic, and geochemical maps).

Thematic maps are in wide use by cartographers around the world, but it is important for map users to realize that these products are now also widely applied to the mapping of objects other than Earth only.

The fourth section of the glossary is the largest component, containing lists of terms for relief features mapped on various planetary surfaces. Lists of terms are provided for Mercury, Venus, Mars, Earth's Moon, the natural satellites of the outer solar system planets, and small bodies such as asteroids and comets. These lists can be quite extensive, and often contain terms that might be unrecognizable to the uninitiated user. As an example, the following list of terms gives a few examples of some features on Mars that are part of the officially recognized nomenclature (from Russell et al., 1992):

Catena – a crater chain, or a string of closely spaced depressions

Cavus – an irregular, steep-sided depression that apparently is not of impact origin

Chaos – a distinctive region of disrupted or broken terrain

Chasma – a steep-walled trough or large canyon

Dorsum – a topographic ridge or other elongated, raised structure

Fossa – a long, narrow, shallow depression or a narrow, linear trench

Mensa – a flat-topped, steep-sided elevated feature

Mons – a mountain

Patera – a shallow crater with scalloped, complex walls or edges

Planitia – a low plain, or a large level expanse of lowlands

Planum – a large elevated plateau of high plain

Tholus – a small domed hill

Vallis – a valley

There are several other terms applied to features on Mars, all with Latin origins that may not be readily interpretable by many users. Some terms are applied consistently to all planetary surfaces, while others are unique to only one planetary object. This section quite easily could be the one of greatest use to the broadest audience of planetary map users.

The fifth section of the glossary describes relief features found on solar system bodies in general. Here it is important for the map user to understand terms that are presumed to be familiar to all users, but which may not always be the case. Two examples of potentially confusing terms in wide use in planetary maps are:

Crater – a circular to elongate depression. Craters formed by the impact of a celestial object usually have ejected material distributed radially around the depression, usually have raised rims, and in larger diameters can have raised central peaks or mounds. Craters formed by other processes (e.g., volcanism) usually lack one or more of the attributes of an impact crater, and may have additional relationships (e.g., volcanic craters often occur in aligned trends and are of similar overall dimensions).

Ridge - a positive-relief linear feature on the surface of a planetary body. Ridges can be of various dimensions and origins (e.g., steep or shallow slopes, long or short lengths).

These two examples illustrate that some commonly used terms can imply an origin (craters are most often assumed to be of impact origin), whereas other terms are specifically intended not to imply an origin (e.g., ridge).

The sixth and final section of the glossary contains certain thematic terms in wide use in planetary mapping, but which may not be familiar to many new users of planetary maps. An example is given here of a term derived from the exploration of Earth's Moon:

Mascon - positive gravitational anomaly on Earth's Moon, spatially associated with the largest circular mare. Mascons are observable when an orbiting spacecraft's speed in orbit around the Moon is altered by the increased gravitational attraction produced by a buried concentration of mass within a mare area. First described after monitoring the orbits of the Lunar Orbiter spacecraft in the 1960s, the term "mascon" is the concatenation of the two English words "mass concentration" (e.g., an enhanced concentration of mass relative to the surrounding lunar terrain).

This term is in wide use among lunar scientists but may mean nothing to the new user.

The glossary will contain many more examples like the ones listed here, and it is our intent to periodically update the glossary on the web as additional terms and definitions come into use. We believe that such a glossary, general in scope but directed specifically at users of planetary maps, will meet a need in the larger community of map users around the world. As exploration continues throughout the solar system, the number of mapped surfaces off the Earth will only continue to increase.

International Words Relevant to Planetary Maps

The usage of words is quite variable in many languages in wide use around the world. It is not our intent to try to document map terms in all possible languages, but there are some terms that can have confusing or different interpretations in various languages. An example of the potential problem is the numerical term "billion", which has two distinct meanings in wide usage. One billion means a thousand million (one times ten to the 9th power) in the United States and France, but this same name means a million million (one times ten to the 12th power) in Great Britain and Germany (Webster's Dictionary, 1997). Such a difference could cause a significant error in map scale interpretation. Map descriptions can have similar discrepancies in their usage. The glossary includes descriptions of such discrepancies as an aid in clarifying cases of potential confusion among mapping terms.

The international section also provides multiple language expressions for commonly encountered mapping features. As an example, "mountain" in English is "berg" in Dutch and

German, “montana” in Spanish, and “montagne” in French. The International Sand Collectors Society has compiled a list of geographical terms in many languages, some of which might be encountered on planetary maps. Following are examples obtained through information provided by ISCS (2000):

| Term | English | Dutch | French | German | Italian | Portuguese | Spanish |
|-------------|---------|---------|--------|--------|-----------|------------|---------|
| Sand | sand | zand | sable | sand | sabbia | aeria | arena |
| Valley | valley | tal | valee | tal, | valle | vale | vale |
| Volcano | volcano | vulkaan | volcan | vulkan | vulcanico | volcao | volcan |

The names of the planets themselves have a wide variety in international languages. Bakich (2000, pp. 44-45) provides a table that lists the names of the planets, Sun and Moon in twelve languages. For example, Mars (English) is Merrikh (Arabic), Mars (Danish, French, German, Latin, Russian and Swedish), Ares (Greek), Ma'adim (Hebrew), Marte (Italian and Spanish), and Kasei (Japanese).

The glossary will include listing of words in several languages likely to be encountered on maps of planetary surfaces, as an aid to increased use of planetary maps throughout the world.

Finally, we will include a brief explanation of the procedure used in naming features on planetary objects. The International Astronomical Union (IAU) is recognized as the global arbiter of planetary and satellite nomenclature. Task groups for various planetary body subdivisions were formed to oversee the assignment of names for newly identified features. When images are first obtained of the surface of a planet or satellite, a theme for naming features is chosen and a few important features are named, usually by members of the appropriate IAU Task group. Later, as better images and maps become available, additional features are named, usually at the request of individual investigators mapping or describing specific surface features. Names are considered “provisional” once approved by the appropriate Task group, and only become official after being approved by the entire IAU assembly, which represents scientists from all countries of the world. Many people do not realize that there is a well established procedure for applying names to planetary surfaces, one that has made the process a global effort and not just the jurisdiction of the space-faring nations.

In summary, the glossary produced by the ICA Commission on Planetary Cartography consists of six distinct sections (general terms, solar system cartographic terms, general cartographic terms, relief terms for individual planetary objects, general relief terms for solar system bodies, and thematic terms) that should aid all users of planetary map products. A separate component of the project is a compilation of international words relevant to planetary maps. Both of these aspects of the glossary project will be discussed in an oral presentation at the 2001 ICC in Beijing, China.

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